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In later childhood, auditory imagery—that is, verbal imagery—appeared. Motor imagery, it appears, plays less of a rôle than has generally been supposed. A fairly definite correspondence was established between ideational type and kind of material—visual, auditory, motor, etc.—most readily remembered by each type. Incidentally it was found that the rapid falling off of the memory curve, established by Ebbinghaus and others, did not hold when the test of memory was the amount retained instead of economy in relearning, and when sense instead of nonsense material was used.

In an interesting study on "The Analysis of the Factor of Recall in the Learning Process," Edwina E. Abbott shows that it is better in learning to pause at intervals and try to reproduce, rather than to go on unintermittently jamming the material in. The experiments were made both with nonsense syllables and words, and the subjects were five students from the psychological laboratory. The relative value of "jamming in" and recalling differs with individuals, those having strong "inner-speach" tendencies being more helped by recall than those who depend on reimaging.

Another study by the same author, "On the Analysis of Memory Consciousness in Orthography," establishes certain facts concerning the mental processes of one who learns to spell words. The author found that her four trained subjects invariably substituted visual imagery for the heard letters when the words were spelled out to them, and that the heard letters were never recalled in terms of auditory imagery. Vocalization of the letters when words are presented visually is a hindrance; vocalization of syllables, a help. In general, whatever aids visual presentation, helps along the learning process.

A paper by F. Kuhlmann, on the "Development of Instincts and Habits in Young Birds," gives the results of his observation of young birds in their nests from the time of hatching until they flew away. He recorded their rate of growth in weight, the time of appearance of various motor coordinations and the stages of the appearance of fear. A number of excellent photographs accompany the article.

ABRAM LIPSKY.

NEW YORK.

Über den Austieg der Druckempfindung. G. F. ARPS. Wundt's Psychologische Studien, Bd. IV. (1908). Pp. 431–471.

The article reports a series of experiments carried on in the Leipzig laboratory with the purpose of measuring the period of rise of a pressure sensation, in other words, of determining the relation that exists between the duration of a tactual stimulus and the intensity of the resulting pressure sensation. To this end two stimuli were presented to the subject successively, a normal stimulus of constant weight but variable duration, and a comparison stimulus of constant duration but variable weight. The rise of intensity of the sensation from the standard stimulus was measured by determining for each duration of the standard the weight of the variable stimulus (of constant duration), which gave a sensation of subjectively equal intensity to that given by the standard.

The stimuli were two round pieces of ivory 0.5 cm. in diameter, which were set down on the dorsal side of the first phalanx of the subject's first and second fingers, respectively. The rather complicated apparatus used was mainly electrical, though the comparison stimuli were given by means of a pneumatic pressure-balance. Experiments were made both by the method of limits and by the method of constant stimuli. There was no essential difference in the results obtained by the two methods. Two different standard stimuli were used, the first 134.2 gr., the second 58.5 gr., each with variable durations of from 13 σ to 1385 σ. There were also two comparison stimuli used, of 1 sec. and 500 σ duration, respectively, each with varying weights. Four subjects were tested, although the full series of experiments, using both standard stimuli, both comparison stimuli, and all four combinations of the time-space order, was carried through with only one subject. The steps between the various comparison stimuli were sufficiently small to enable the author to plot with relative accuracy the curve of the rise in intensity of the sensation from the standard stimulus.

The most important result of the experiments was to show that the rise of the sensation seems to be to a great degree independent of the intensity of the standard stimulus—at least for the stimuli here tested. The curves for both standards (134.2 gr. and 58.5 gr.) reach their maxima at about 980 σ and sink again slightly beyond that point. For all curves there is also a secondary maximum at 380 σ, followed by a drop at about 432 σ and then a comparatively steady rise to 980 σ, the absolute maximum. These results hold for all four subjects tested and for both comparison stimuli (1 sec. and 500 σ), though the absolute values of the results differ, of course, in the different cases.

The time-error and position-error are different for the several subjects. All subjects show a tendency to overestimate the standard; for example, a comparison pressure of 156.4 gr. and 1 sec. duration is judged equal to a standard pressure of 134.2 gr. and 980 σ duration. The author explains this overestimation as due partly to the fact that the standard received a "subjective emphasis" for the subject because of the sudden starting up of the electro-magnetic apparatus. Besides this, the attention seemed to the subjects to be directed especially to the standard pressure, and this fact may have caused it to be overestimated. There are several other points of interest, including fluctuations in the attention of the subjects during stimulation, effects of contrast and assimilation both between standard and comparison pressures and between succeeding comparison pressures, and the influence which the intensity of a pressure sensation had on its apparent duration. The author does not attempt an analysis of the different factors, physiological and psychical, which are involved in the main result of these experiments, the long rise of the pressure sensation and the apparently constant character of its curve, regardless of the intensity of the sensation. HELEN D. COOK.

WELLESLEY COLLEGE.